

REMARKS

Applicants have amended claim 14 to more particularly point out and distinctly claim the subject matter which they regard as their invention. This amendment, support for which can be found in original claim 17, has necessitated both cancellation of claim 17 and amendment to the dependency of claim 18. Applicants have also cancelled claims 1-13 and 21-30, which are drawn to non-elected inventions. No new matter has been introduced by the above amendments.

Claims 14-16 and 18-20 are currently pending. Reconsideration of the application, as amended, is requested in view of the remarks below.

Rejection under 35 U.S.C. § 102(b)

The Examiner rejects claims 14-16, 19, and 20 as being anticipated on two grounds. See the Office Action, pages 2-5. Applicants traverse each ground as follows:

I

Claims 14-16, 19, and 20 are rejected as being anticipated by Steinkraus, Food Control, (1997) Vol. 8, No. 5/6, pp 311-317 ("Steinkraus"). See the Office Action, page 2, lines 19-22.

Independent claim 14 is discussed first. Claim 14, as amended, covers a method for producing a fermentation product (e.g., wine) from starch-containing produce (e.g., rice). The method includes four sequential steps: (1) treating a starch-containing produce slurry with a first starch hydrolyzing enzyme that hydrolyzes starch to oligosaccharide (e.g., α -amylase), (2) removing insoluble materials from the slurry to obtain a starch hydrolysate-containing solution, (3) treating the starch hydrolysate-containing solution with a second starch hydrolyzing enzyme that hydrolyzes starch or oligosaccharide to glucose (e.g., glucoamylase) to obtain a glucose-rich syrup, and (4) treating the glucose-rich syrup with a microorganism that converts glucose to a fermentation product (e.g., *Aspergillus oryzae*). In other words, the method includes adding a starch hydrolyzing enzyme, another starch hydrolyzing enzyme, and a microorganism in three different steps. In addition, the method requires removing insoluble materials from a starch-containing produce slurry to obtain a starch hydrolysate-containing solution.

Steinkraus describes wine fermentation by treating boiled rice with a yeast *Aspergillus oryzae*. See page 314, right column, 2nd paragraph. The Examiner cites an article titled " α -

amylase and glucoamylase from *Aspergillus oryzae*” to show that this yeast produces α -amylase and glucoamylase under the fermentation condition. See the Office Action, page 3, lines 12-15. However, even assuming that the Examiner is correct, Steinkraus at most discloses a method of producing rice wine by treating boiled rice with *Aspergillus oryzae* containing α -amylase and glucoamylase in a single step. It does not disclose obtaining a fermentation product by adding the first starch hydrolyzing enzyme (e.g., α -amylase), the second starch hydrolyzing enzyme (e.g., glucoamylase), and the microorganism (e.g., *Aspergillus oryzae*) in three different steps, as required by amended claim 14. It also does not disclose removing insoluble materials from a starch-containing produce slurry to obtain a starch hydrolysate-containing solution, as also required by amended claim 14.

Thus, for at least the reasons set forth above, amended claim 14 is not anticipated by Steinkraus. Neither are claims 15, 16, and 18-20, all of which depend from claim 14.

II

Claims 14-16, 19, and 20 are rejected as being anticipated by Iwano et al., JP 10-248562 (“Iwano”). See the Office Action, page 4, lines 20-21.

Again, independent claim 14 is discussed first. As mentioned above, amended claim 14 covers a method that includes adding a starch hydrolyzing enzyme, another starch hydrolyzing enzyme, and a microorganism in three different steps and removing insoluble materials from a starch-containing produce slurry to obtain a starch hydrolysate-containing solution.

Iwano describes treating malted rice with an exogenous enzyme (including α -amylase, glucoamylase, and an acid protease) and a yeast for brewing wine. See, e.g., the abstract and paragraphs 36 and 37. Similar to Steinkraus, Iwano describes a method of producing rice wine by treating rice with α -amylase, glucoamylase, and a yeast in a single step. It does not disclose obtaining a fermentation product by adding a starch hydrolyzing enzyme (e.g., α -amylase), another starch hydrolyzing enzyme (e.g., glucoamylase), and a microorganism (e.g., *Aspergillus oryzae*) in three different steps, as required by amended claim 14. It also does not disclose removing insoluble materials from a starch-containing produce slurry to obtain a starch hydrolysate-containing solution, as also required by amended claim 14.

Thus, for at least the reasons set forth above, amended claim 14 is not anticipated by Iwano. Neither are claims 15, 16, and 18-20, all of which depend from claim 14.

Rejection under 35 U.S.C. § 103(a)

Claims 17 and 18 are rejected as being obvious over Iwano. See the Office Action, page 5, lines 15-16.

Applicants have cancelled claim 17 and will only discuss claim 18, which depends from claim 14. Like amended claim 14, claim 18 covers a method that includes adding a starch hydrolyzing enzyme, another starch hydrolyzing enzyme, and a microorganism in three different steps and removing insoluble materials from a starch-containing produce slurry to obtain a starch hydrolysate-containing solution.

As discussed above, Iwano does not disclose obtaining a fermentation product by adding the first starch hydrolyzing enzyme (e.g., α -amylase), the second starch hydrolyzing enzyme (e.g., glucoamylase), and the microorganism (e.g., *Aspergillus oryzae*) in three different steps, as required by claim 18. Neither does it disclose removing insoluble materials from a starch-containing produce slurry to obtain a starch hydrolysate-containing solution, as also required by claim 18. Nor does Iwano suggest these two limitations required by claim 18. Thus, claim 18 is not obvious over Iwano.

Even if a *prima facie* case of obviousness has been made (which Applicants do not concede), it can be successfully rebutted by a showing of three unexpected advantages of the method of claim 18. First, as pointed out in the Specification, the insoluble materials obtained by treating a starch-containing produce slurry with a first starch hydrolyzing enzyme (e.g., α -amylase) contain mostly coagulated proteins. See, e.g., page 3, lines 24-27. Removing the coagulated proteins from the slurry facilitates further hydrolysis of starch or oligosaccharide by the second starch hydrolyzing enzyme (e.g., glucoamylase) and produces a high-protein product (e.g., high-protein rice flour, a highly commercially valuable product). See, e.g., Example 1. Second, the Specification also points out that different enzymes or microorganisms have different optimal operative conditions. See, e.g., page 4, lines 29-30. Thus, it is preferable to add the first starch hydrolyzing enzyme, the second starch hydrolyzing enzyme, and the

microorganism in three different steps as required by claim 18 so that each enzyme or microorganism is used under its optimal operative conditions to increase the yield of the final product (e.g., ethanol). Finally, the Specification shows that fermenting a glucose-rich syrup results in a much higher ethanol yield than fermenting a starch hydrolysate having a low glucose concentration. Specifically, according to Example 4, in the process of fermenting a glucose-rich syrup having a glucose concentration of 114 mg/mL, the ethanol concentration unexpectedly increased to 10.5% in only three days and reached 13.5% in only five days. By contrast, only 1% of ethanol was produced from the starch hydrolysate that had a glucose concentration of only 11 mg/mL under the same fermentation conditions after 5 days. Given the above unexpected advantages, claim 18 is clearly not obvious over Iwano.

CONCLUSION

Applicants submit that the grounds for rejection asserted by the Examiner have been overcome, and that claims 14-16 and 18-20, as pending, define subject matter that is novel and nonobvious. On this basis, it is submitted that these claims are now in condition for allowance, an action of which is requested.

Enclosed is a check for the Petition for Extension of Time fee. Please apply any other charges to deposit account 06-1050, referencing Attorney's Docket No.: 08919-104001.

Respectfully submitted,

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